Working Draft

Version 9.40 - June 2005

Purpose Statement

This booklet provides reference information about Earth and Earth-Sun system spacecraft with a NASA affiliation.

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The NASA Vision

To improve life here,
To extend life to there,
To find life beyond.

The NASA Mission

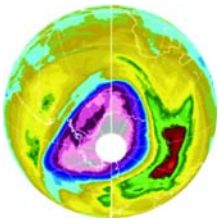
To understand and protect our home planet,
To explore the universe and search for life,
To inspire the next generation of explorers...
as only NASA Can

www.nasa.gov

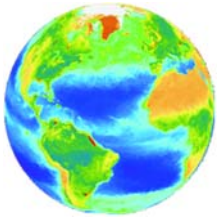
Science Mission Directorate
Earth-Sun System Division

Focus Areas

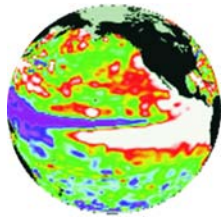
The NASA Earth-Sun System Division seeks to develop a scientific understanding of the Earth-Sun system and its response to natural and human-induced changes to enable improved prediction of climate, weather, and natural hazards for present and future generations.



Atmospheric Composition

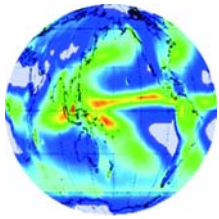


Carbon Cycle & Ecosystems

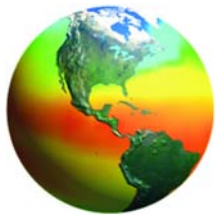


Climate Variability & Change

Earth Surface & Interior



Water & Energy Cycle



Weather

Sun Solar System

Research Strategy

NASA's Earth-Sun System Division is developing a scientific understanding of the Earth-Sun system and its response to natural and human-induced changes to enable improved prediction capability for climate, weather, and natural hazards. The Earth-Sun System Division has an end-to-end strategy to ensure that all the information, understanding, and capabilities derived from its research program achieve maximum usefulness for the scientific and decision-making communities. Increasing our knowledge of the Earth system is the goal of the Earth-Sun System Division's Research Program, which is complemented by the Earth-Sun System Division's Applied Sciences Program and Technology Program.

The Earth-Sun System Division has defined its research strategy around a hierarchy of scientific questions. At the highest level, the Earth-Sun System Division is attempting to provide an answer to one overarching question:

How is the Earth changing and what are the consequences for life on Earth?

The magnitude and scope of this question are too large to allow a simple answer, requiring a lower tier of questions that provide the conceptual approach that the Earth-Sun System Division is taking to improve our knowledge of the Earth system:

Variability: How is the global system changing?

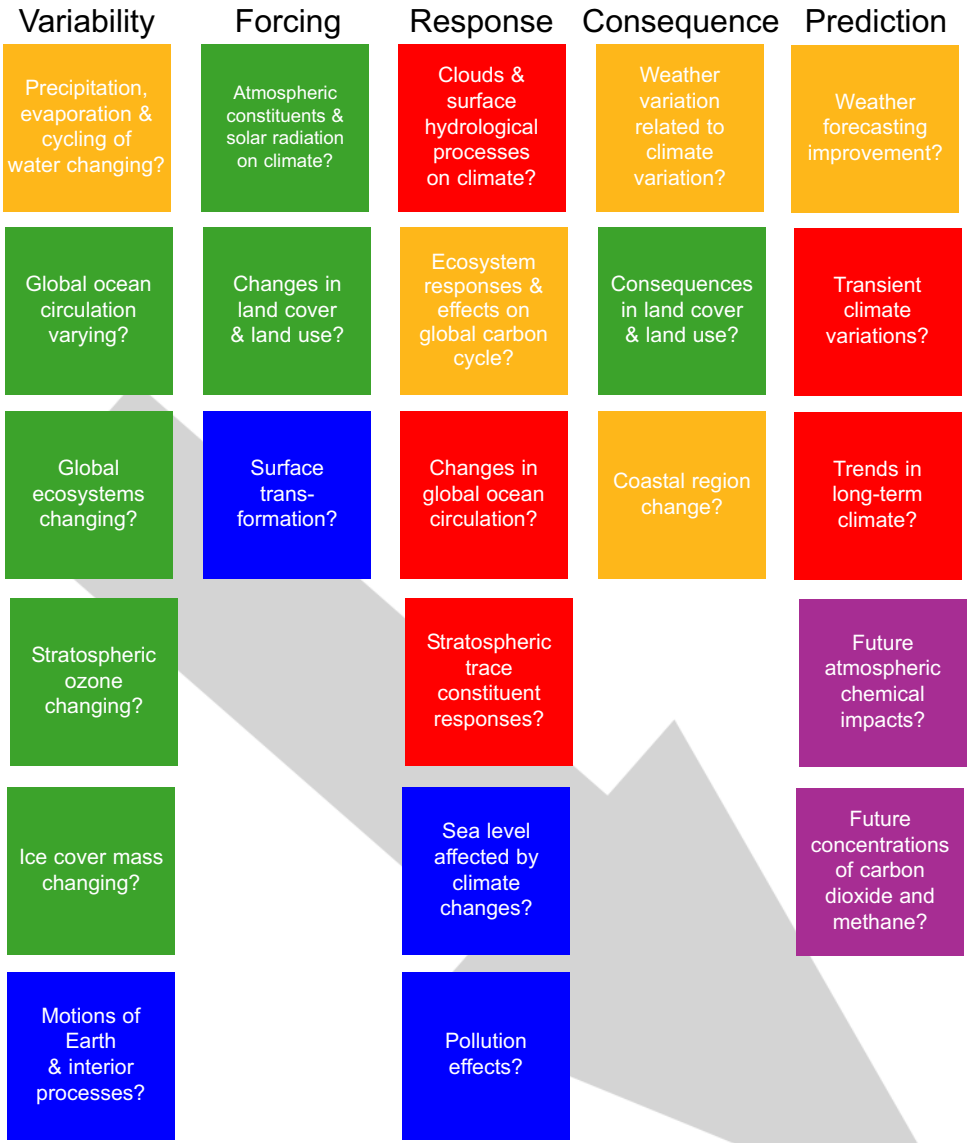
Forcing: What are the primary forcings of the Earth system?

Response: How does the Earth system respond to natural and human-induced changes?

Consequence: What are the consequences of change in the Earth system for human civilization?

Prediction: How well can we predict future changes in the Earth system?

Science Questions



- Requires both systematic & exploratory satellites
- Requires systematic satellite observations
- Requires exploratory satellite observations
- Requires pre-operational and/or systematic/exploratory satellites
- Use available/new observations in better models

Applications of National Priority


Agricultural Efficiency


Air Quality


Aviation


Carbon Management


Coastal Management


Ecological Forecasting


Disaster Management


Energy Management


Homeland Security

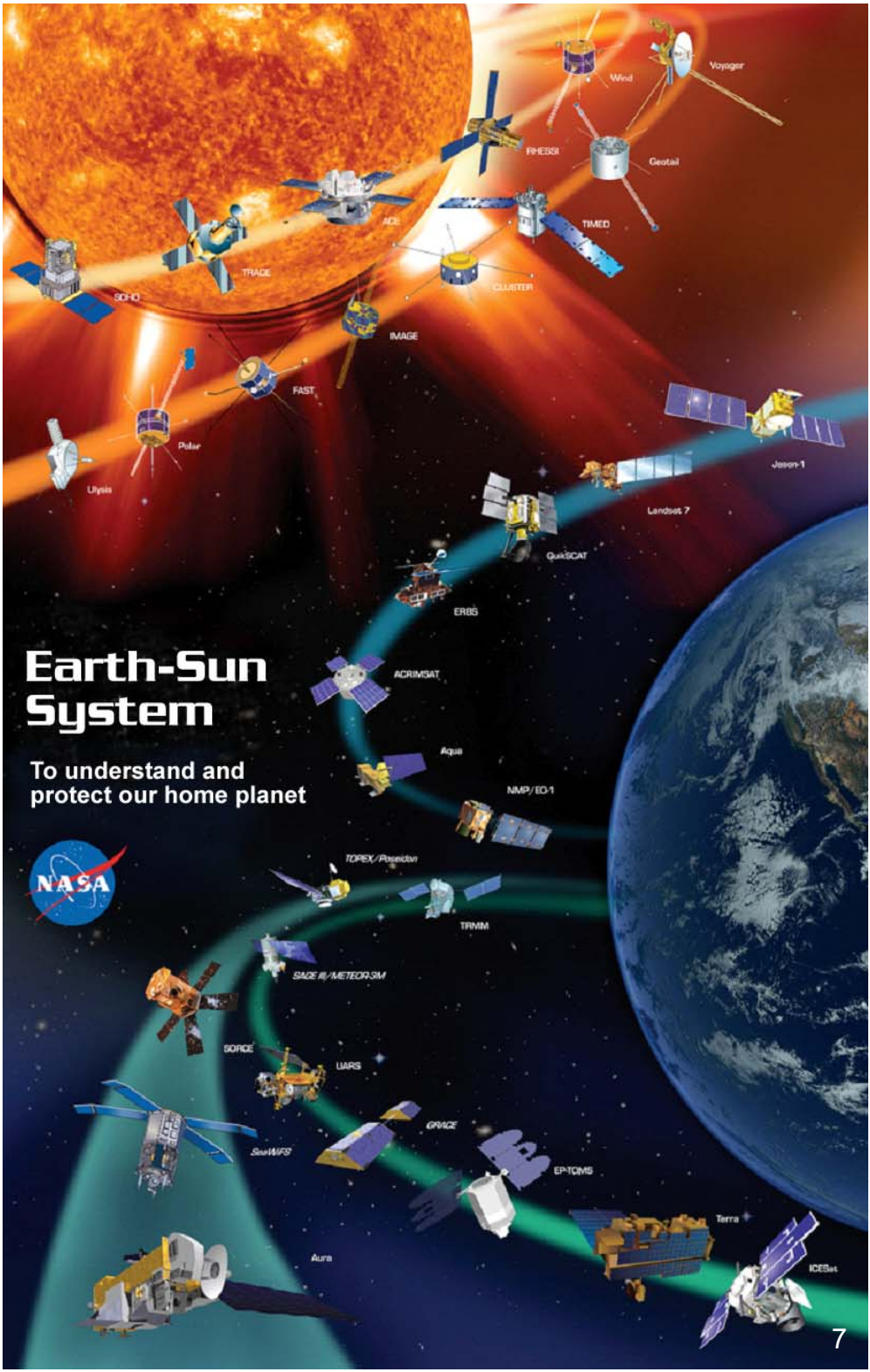

Invasive Species


Public Health

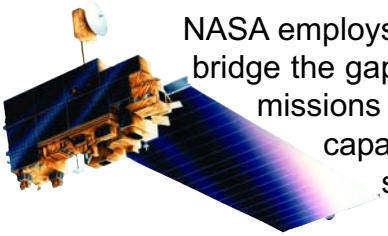

Water Management

The NASA Applied Sciences Program mission is to expand and accelerate the realization of economic and societal benefits from Earth science, information, and technology. The overarching goal is to bridge the gap between Earth system science research results and the adoption of observations and prediction capabilities for reliable and sustained use in decision support.

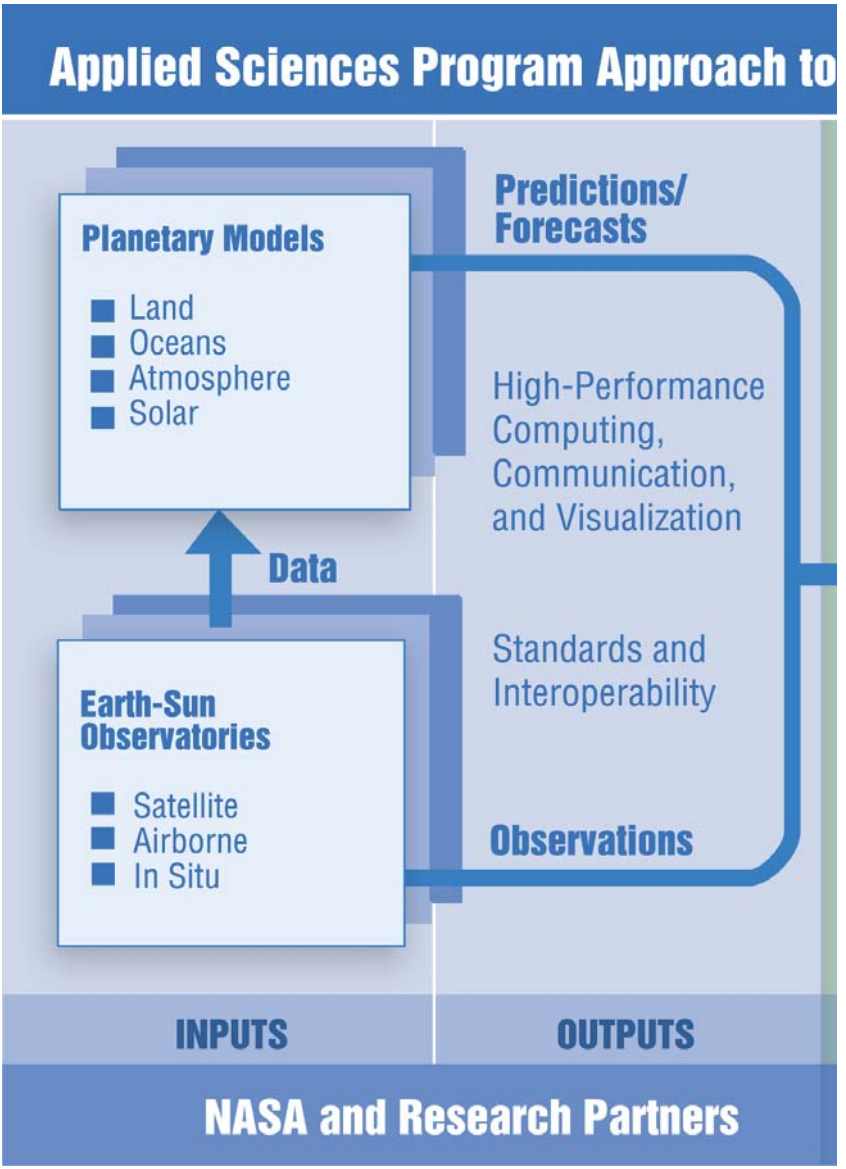
http://www.asd.ssc.nasa.gov/apps.aspx

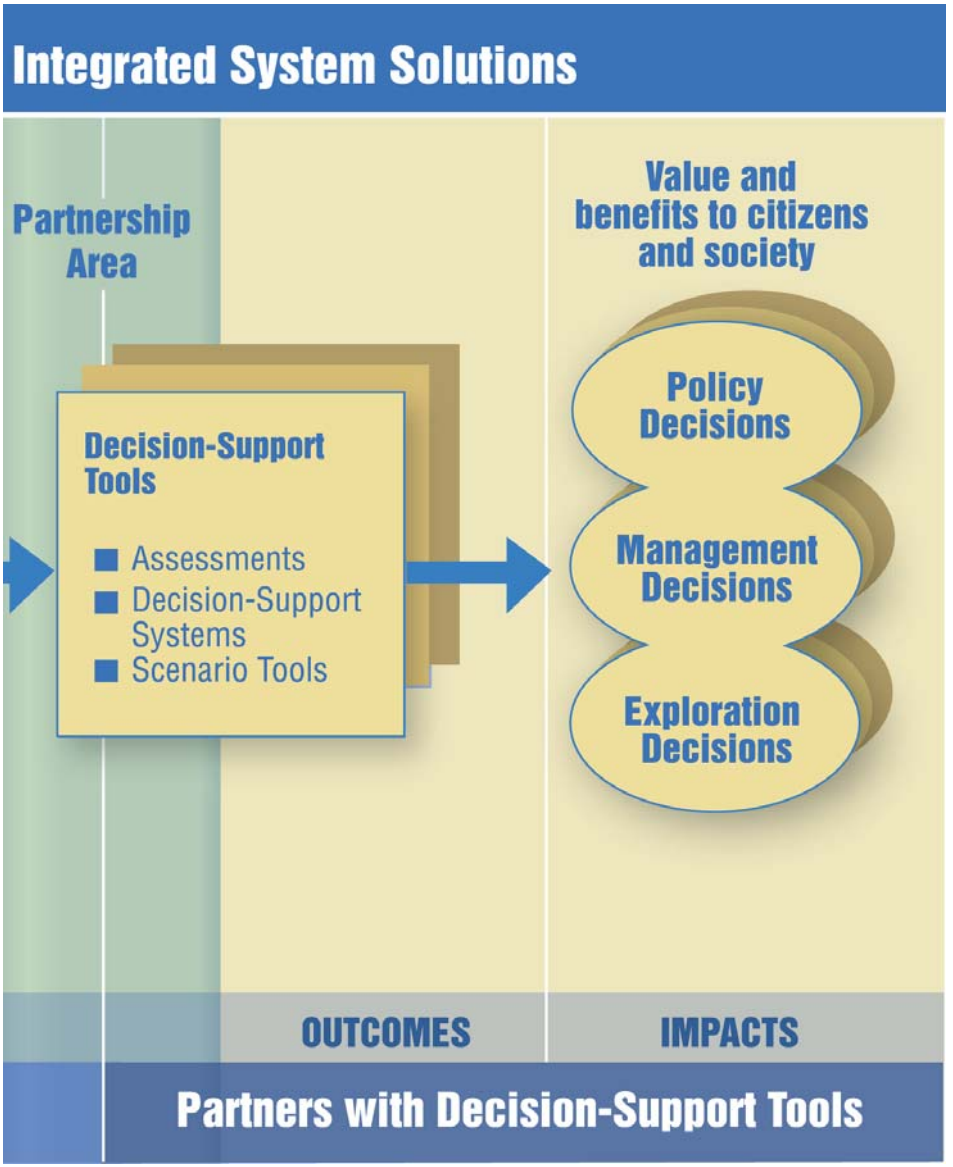

Earth-Sun System
To understand and protect our home planet
NASA
Wind
Voyager
RHESSI
Geotail
ACE
TIMED
TRACE
SOHO
CLUSTER
IMAGE
FAST
Polar
Ulysis
Jason-1
Landsat 7
QuikSCAT
ERBS
ACRIMSAT
Aqua
NMP/EO-1
TOPEX/Poseidon
TRMM
SAGE III/METEOR-3M
SORCE
UARS
SeaWiFS
GRACE
EP-TOMS
Terra
Aura
ICESat

Integrated System Solutions Architecture



NASA employs a systems engineering approach to bridge the gap between Earth-Sun system science missions and models. The data and prediction capabilities are adopted for reliable and sustained use in decision support.





http://science.hq.nasa.gov/earth-sun/applications/index.html

Deployed NASA-Led Earth Missions

Aqua

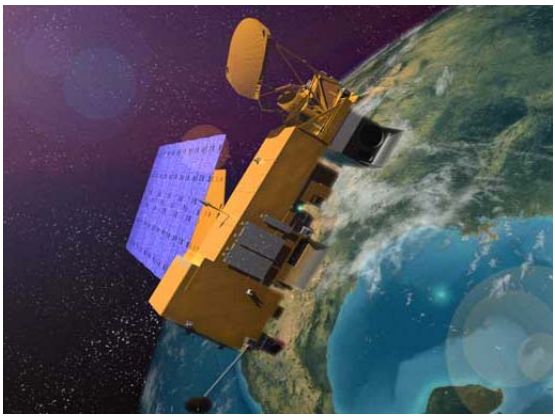
Aqua is designed to acquire precise atmospheric and oceanic measurements to provide a greater understanding of their role in the Earth's climate and its variations. The satellite's instruments provide regional to global land cover, land cover change, and atmospheric constituents.

Sensors:
MODIS - Moderate Resolution Imaging Spectroradiometer
AIRS - Atmospheric Infrared Sounder
AMSU-A - Advanced Microwave Sounding Unit-A
CERES - Clouds and the Earth's Radiant Energy System
HSB - Humidity Sounder for Brazil
AMSR-E - Advanced Microwave Scanning Radiometer-EOS

Links:
http://aqua.nasa.gov
http://eos-pm.gsfc.nasa.gov

Applications





VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 705 km
- Inclination: 98.2°
- Launch Date: May 4, 2002
- Design Life: 5 years
- Measurements: Vegetation dynamics

OWNER
- Brazil, INPE
- Japan, JAXA (formerly NASDA)
- U.S., NASA

Aura

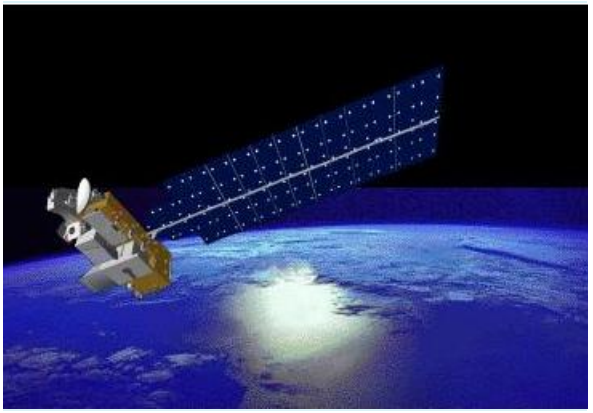
Aura's mission is designed to observe the atmosphere to answer the following three high-priority environmental questions: Is the Earth's ozone layer recovering? Is air quality getting worse? How is the Earth's climate changing? Aura's new objective over previous atmospheric research missions is also to probe the Earth's troposphere.

Sensors:
HIRDLS - High Resolution Dynamics Limb Sounder
MLS - Microwave Limb Sounder
OMI - Ozone Monitoring Instrument
TES - Tropospheric Emission Spectrometer

Links: (opens a new browser window)
http://aura.gsfc.nasa.gov/

Applications



VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 705 km
- Inclination: 98.2°
- Launch Date: July 15, 2004
- Design Life: 5 years
- Measurements: Stratospheric and troposhperic ozone

OWNER
- U.K., Meteorological Office
- U.S., NASA

ERBS

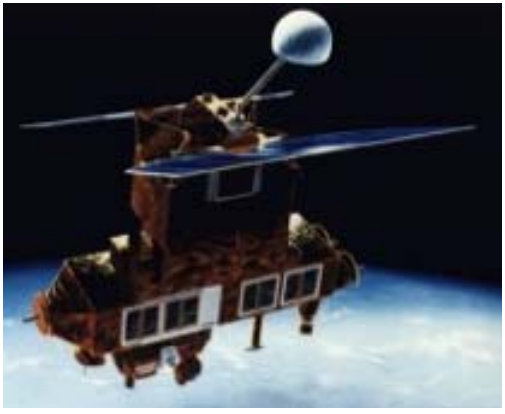
Earth Radiation Budget Satellite

The ERBS mission is to investigate how energy from the Sun is absorbed and re-emitted by the Earth. Observations from ERBS are also used to determine the effects of human activities (such as burning fossil fuels and the use of chlorofluorocarbons) and natural occurrences (such as volcanic eruptions) on the Earth's radiation balance. This system is only partially operational.

SENSORS:
SAGE II - Stratospheric Aerosol and Gas Experiment II
ERBE Nonscanner - Earth Radiation Budget Experiment Nonscanner
ERBE Scanner - Earth Radiation Budget Experiment Scanner

LINKS:
http://asd-www.larc.nasa.gov/erbe
http://eosweb.larc.nasa.gov/EDDOCS/Erb_Satellite.html

Applications



VITAL FACTS

- Orbit Type: Non Sun-Synchronous
- Altitude: 585 km
- Inclination: 57°
- Launch Date: October 5, 1984
- Design Life: 1-2 years (exceeded)
- Measurements: Regional and global coverages of solar irradi ance, radiance, and albedo vertical distributions of aerosols, ozone, and CO2

OWNER
- U.S., NASA

GRACE

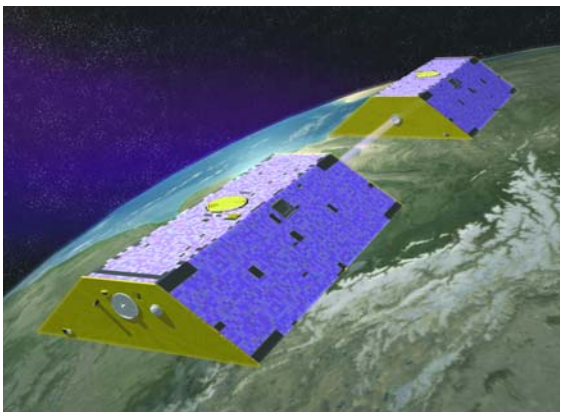
Gravity Recovery and Climate Experiment

GRACE is a cooperative mission with Germany to obtain an accurate global and high-resolution determination of both the static and the time-variable components of the Earth's gravity field. Changes in the distance between the twin satellites are used to make gravitational field measurements.

SENSORS:
GPS Receiver - Global Positioning System Receiver
LRA - Laser Retroreflector Array
KBR or HAIRS - K-Band Ranging System or High Accuracy Inter-satellite Ranging System
SCA - Star Camera Assembly
SuperSTAR - SuperSTAR Accelerometer

LINKS:
http://www.csr.utexas.edu/grace/

Applications



VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 705 km
- Inclination: 98.2°
- Launch Date: July 15, 2004
- Design Life: 5 years
- Measurements: Gravitational field (to improve understanding of geodesy, glaciology, hydrology, oceanography, and solid earth sciences)

OWNER
- U.K., Meteorological Office
- U.S., NASA

ICESat

Ice, Clouds, and Land Elevation Satellite

ICESat is a benchmark EOS mission to achieve the ESE/EOS requirements for measuring ice sheet mass balance, cloud and aerosol heights, atmospheric optical densities, and vegetation and land topography. It will provide cloud property information not otherwise available from passive sensors by processing the altimeter data throughout its orbit.

SENSORS:
GLAS - Geo-science Laser Altimeter System
GPS Receiver - Global Positioning System Receiver

LINKS:
http://icesat.gsfc.nasa.gov

Applications

VITAL FACTS

- Orbit Type: Non Sun-Synchronous
- Altitude: 600 km
- Inclination: 94°
- Launch Date: January 12, 2003
- Design Life: 4 years
- Measurements: Land, ice, and sea ice topography; ice sheet mass balance

OWNER
- U.S., NASA

LAGEOS I

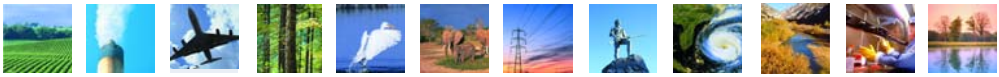
Laser Geodynamics Satellite I

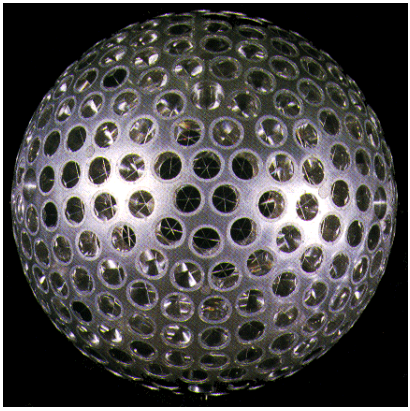
LAGEOS is the first NASA satellite dedicated wholly to laser ranging: science is performed by reflecting laser light from the vehicle's 426 cube-corner retroreflectors. It was designed to act as a permanent reference point so that the Earth's progress could be tracked relative to the satellite.

SENSORS:
LRA - Laser Retroreflector Array
SLR2000 - Satellite Laser Ranging 2000 Station

LINKS:
http://ilrs.gsfc.nasa.gov/satellite_missions/list_of_satellites/lageos.html
http://www.earth.nasa.gov/history/lageos/lageos1.html

Applications





VITAL FACTS

- Orbit Type: Non-Sun Synchronous
- Altitude: 6000 km
- Inclination: 110°
- Launch Date: May 4, 1976
- Design Life: 40 years
- Measurements: Earth dynamics: crust motion and rotation changes

OWNER
- Italy, ASI
- U.S., NASA

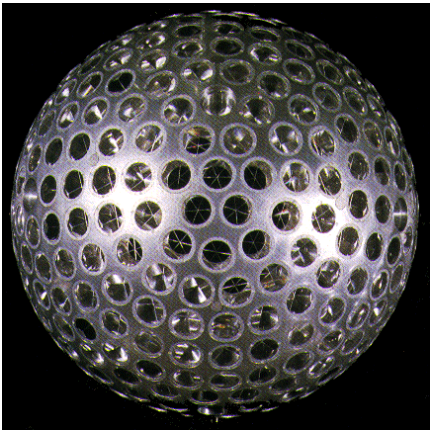
LAGEOS II

Laser Geodynamics Satellite II

LAGEOS is the first NASA satellite dedicated wholly to laser ranging: science is performed by reflecting laser light from the vehicle's 426 cube-corner retroreflectors. It was designed to act as a permanent reference point so that the Earth's progress could be tracked relative to the satellite.

SENSORS:
LRA - Laser Retroreflector Array
SLR2000 - Satellite Laser Ranging 2000 Station

LINKS:
http://www.earth.nasa.gov/history/lageos/lageos1.html
http://ilrs.gsfc.nasa.gov/satellite_missions/list_of_satellites/lageos.html



VITAL FACTS

- Orbit Type: Non-Sun Synchronous
- Altitude: 5900 km
- Inclination: 52°
- Launch Date: October 22, 1992
- Design Life: 40 years
- Measurements: Earth dynamics: crust motion and rotation changes

OWNER
- Italy, ASI
- U.S., NASA

NMP EO-1

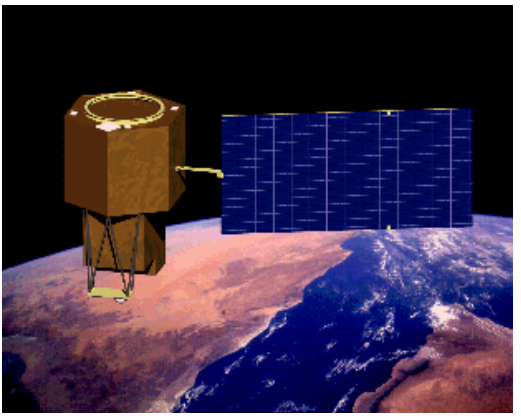
New Millennium Program Earth Observing 1

EO-1 is designed to demonstrate and validate advanced instruments, spacecraft systems, and mission concepts in flight. It has returned scientific data as a by-product of its testing to support land cover change and atmospheric constituents.

SENSORS:
ALI - Advanced Land Imager
Hyperion - Hyperspectral Imager
LAC - Linear Etalon Imaging Spectrometer (LEISA) Atmospheric Corrector

LINKS:
http://eo1.gsfc.nasa.gov

Applications



VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 705 km
- Inclination: 98.2°
- Launch Date: November 21, 2000
- Design Life: 2 years
- Measurements: Land cover and and use change

OWNER
- U.S., NASA

QuikSCAT

Quick Scatterometer

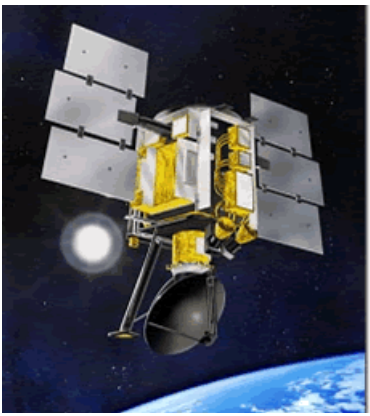
QuikSCAT, a "quick recovery" mission to fill the gap created by the loss of data from NSCAT, is benchmarked with the National Oceanic and Atmospheric Administration (NOAA)/National Environmental Satellite, Data, and Information Service (NESDIS) Office of Research and Applications. QuikSCAT is currently intended to record sea-surface wind speed and direction data for global climate research and operational weather forecasting and storm warning.

SENSORS:
SeaWinds - SeaWinds

LINKS:
http://winds.jpl.nasa.gov/missions/quikscat/index.cfm

Applications



VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 803 km
- Inclination: 98.6°
- Launch Date: June 19, 1999
- Design Life: 6 years
- Measurements:ea surface wind velocity and wind direction

OWNER
- U.S., NASA

SORCE

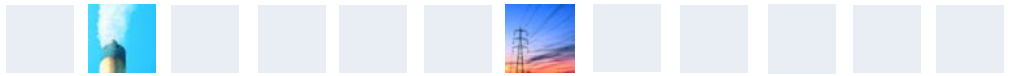
Solar Radiation and Climate Experiment

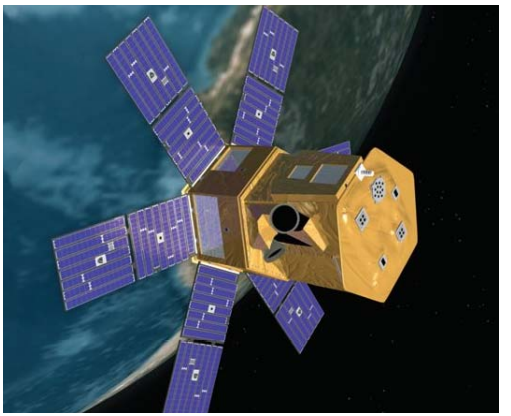
SORCE is a NASA-sponsored project with the University of Colorado's Laboratory for Atmospheric and Space Physics in Boulder. SORCE provides total irradiance measurements and the full spectral irradiance measurements required by climate studies to understand the role of the Sun's variations on the Earth's climate.

SENSORS:
XPS - Extreme Ultraviolet (XUV) Photometer System
TIM - Total Irradiance Monitor
SIM - Spectral Irradiance Monitor
SOLSTICE - Solar Stellar Irradiance Comparison Experiment A&B

LINKS:
http://lasp.colorado.edu/sorce/

Applications





VITAL FACTS

- Orbit Type: Non Sun-Synchronous
- Altitude: 640 km
- Inclination: 40°
- Launch Date: January 25, 2003
- Design Life: 5 years
- Measurements: Solar spectral irradiance

OWNER
- U.S., NASA

SRTM

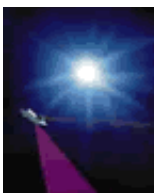
Shuttle Radar Topography Mission

The goal of the Shuttle Radar Topography Mission (SRTM), a joint project of NASA, the National Geospatial-Intelligence Agency, and the German and Italian space agencies, was to map the world in three dimensions. In its 11-day mission on STS-99 in February 2000, SRTM collected an unprecedented 8.6 Terabytes of interferometric C-band Synthetic Aperture Radar (SAR) data (equivalent to about 14,317 CDs).

SENSORS:
SIR-C - Spaceborne Imaging Radar-C
X-SAR - X-Band Synthetic Aperture Radar

LINKS:
http://www.jpl.nasa.gov/srtm/

Applications



VITAL FACTS

- Orbit Type: Non Sun-Synchronous
- Altitude: 233 km
- Inclination: 57°
- Launch Date: February 11, 2000
- Design Life: 11-day STS mission
- Measurements: Gridded heights of 80% of the Earth's surface

OWNER
- U.S., NASA

Terra

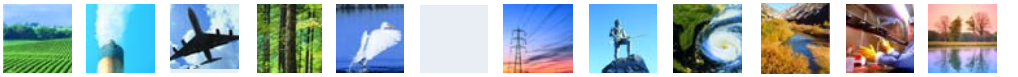
Solar Radiation and Climate Experiment

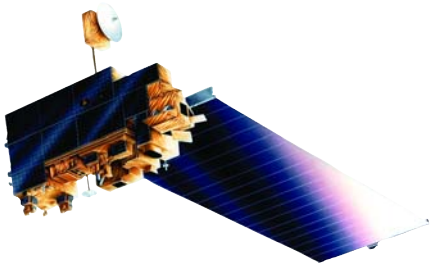
The Terra satellite provides global data on the state of the atmosphere, land, and oceans, as well as their interactions with solar radiation and with one another. Japan, Canada, and the U.S. have provided instruments for this mission.

SENSORS:
MODIS - Moderate Resolution Imaging Spectroradiometer
CERES - Clouds and the Earth's Radiant Energy System
MOPITT - Measurements of Pollution in the Troposphere
MISR - Multi-angle Imaging Spectro-Radiometer
ASTER - Advanced Spaceborne Thermal Emission and Reflection Radiometer

LINKS:
http://terra.nasa.gov

Applications





VITAL FACTS

- Orbit Type: Non Sun-Synchronous
- Altitude: 640 km
- Inclination: 40°
- Launch Date: January 25, 2003
- Design Life: 5 years
- Measurements: Surface bi-directional reflectance distribution function

OWNER
- U.S., NASA

TOMS-EP

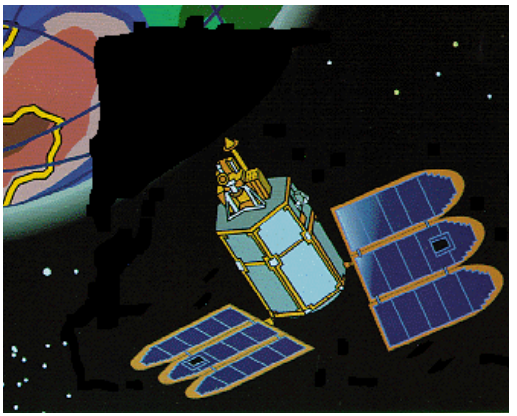
Total Ozone Mapping Spectrometer - Earth Probe

The Total Ozone Mapping Spectrometer-Earth Probe (TOMS-EP) provides global measurements of total column ozone and its variation on a daily basis. Together with the TOMS aboard Nimbus-7 and Meteor-3, TOMS-EP provides a long-term dataset of daily ozone covering about two decades.

SENSORS:
TOMS - Total Ozone Mapping Spectrometer

LINKS:
http://toms.gsfc.nasa.gov

Applications



VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 740 km
- Inclination: 98.385°
- Launch Date: July 2, 1996
- Design Life: 2 years (exceeded)
- Measurements: Aerosol index

OWNER
- U.S., NASA

TOPEX/Poseidon

Topographic Experiment/Poseidon

TOPEX/Poseidon is a joint mission between France and the U.S. to monitor global ocean circulation, to improve global climate predictions, and to monitor events such as El Niño Southern Oscillation conditions and ocean eddies.

SENSORS:
GPS Receiver - Global Positioning System Receiver
LRA - Laser Retroreflector Array
TMR - TOPEX Microwave Radiometer
SSALT - Solid State Radar ALTimeter
DORIS - Doppler Orbitography and Radiopositioning Integrated by Satellite
NRA - NASA Radar Altimeter

LINKS:
http://topex-www.jpl.nasa.gov/

Applications

VITAL FACTS

- Orbit Type: Non Sun-Synchronous
- Altitude: 1,336 km
- Inclination: 66°
- Launch Date: August 10, 1992
- Design Life: 5 years
- Measurements: Ocean topography

OWNER
- France, CNES
- U.S., NASA

TRMM

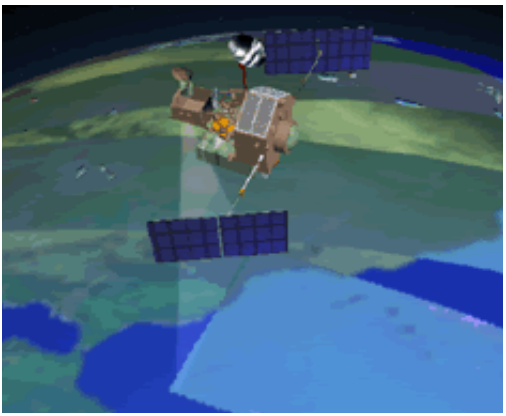
Tropical Rainfall Measuring Mission

TRMM is a joint mission between NASA and the Japan Aerospace Exploration Agency (JAXA) of Japan to monitor and study tropical rainfall and the associated release of energy that helps to power the global atmospheric circulation shaping both weather and climate around the globe.

SENSORS:
CERES - Clouds and the Earth's Radiant Energy System
LIS - Lightning Imaging Sensor
TMI - TRMM Microwave Imager
VIRS - Visible Infrared Scanner
PR - Precipitation Radar

LINKS:
http://trmm.gsfc.nasa.gov

Applications



VITAL FACTS

- Orbit Type: Non Sun-Synchronous
- Altitude: 402 km
- Inclination: 35°
- Launch Date: November 27, 1997
- Design Life: 3 years (exceeded)
- Measurements: Earth's radiation budget and atmospheric radiation

OWNER
- Japan, JAXA (formerly NASDA)
- U.S., NASA

UARS

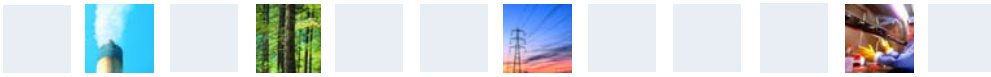
Upper Atmosphere Research Satellite

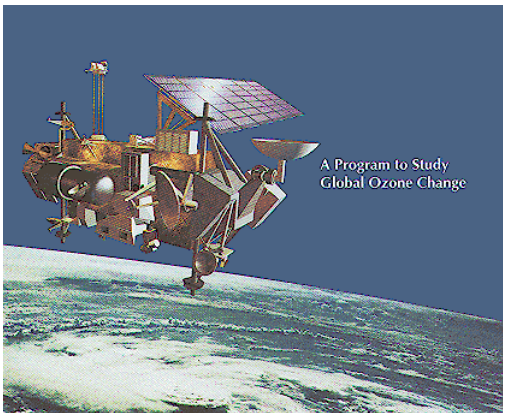
UARS is the first NASA mission that carries out a systematic, comprehensive study of the stratosphere and furnishes important new data on the mesosphere and thermosphere. The United Kingdom and Canada provided some of the instruments for this mission.

SENSORS:

MLS - Microwave Limb Sounder
SOLSTICE - Solar Stellar Irradiance Comparison Experiment A&B
ISAMS - Improved Stratospheric and Mesospheric Sounder
HALOE - Halogen Occultation Experiment
HRDI - High Resolution Doppler Imager
WINDII - Wind Imaging Interferometer
SUSIM - Solar Ultraviolet Spectral Irradiance Monitor
CLAES - Cryogenic Limb Array Etalon Spectrometer
ACRIM II - Active Cavity Radiometer Irradiance Monitor II
HEPS - High-Energy Particle Spectrometer
MEPS - Medium-Energy Particle Spectrometer
AXIS - Atmospheric X-ray Imaging Spectrometer
VMAG - Vector Magnetometer

Applications





VITAL FACTS

- Orbit Type: Non Sun-Synchronous
- Altitude: 585 km
- Inclination: 57°
- Launch Date: September 15, 1991
- Design Life: 1.5 years (exceeded)
- Measurements: Energetic electron atmospheric energy input

OWNER

- U.S., NASA

LINKS:

http://umpgal.gsfc.nasa.gov/

Deployed NASA-Led Solar Missions

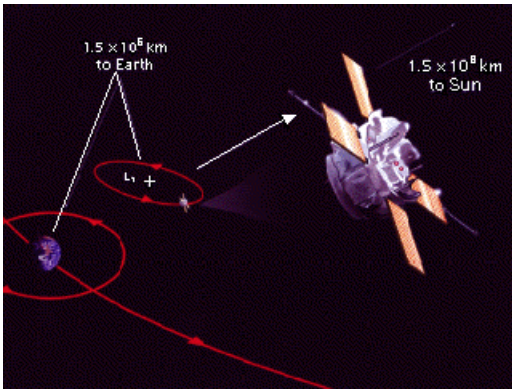
ACE

Advanced Composition Explorer

The ACE spacecraft, carrying six high-resolution sensors and three monitoring instruments, samples low-energy particles of solar origin and high-energy galactic particles.

SENSORS:
CRIS - Cosmic Ray Isotope Spectrometer
SIS - Solar Isotope Spectrometer
ULEIS - Ultra Low Energy Isotope Spectrometer
SEPICA - Solar Energetic Particle Ionic Charge Analyzer
EPAM - Electron, Proton, and Alpha Monitor
SWIMS - Solar Wind Ion Mass Spectrometer
SWICS - Solar Wind Ion Composition Spectrometer
SWEPAM - Solar Wind Electron, Proton, and Alpha Monitor
MAG - Magnetometer

LINKS:
http://www.srl.caltech.edu/ACE/ace_mission.html



VITAL FACTS

- Orbit Type: Earth-sun Libration Point (L1)
- Altitude: 1.5 million km
- Inclination:
- Launch Date: August 25, 1997
- Design Life: 2 years (exceeded)
- Measurements: Isotopic and elemental composition of solar corona, interplanetary medium, local interstellar medium, and Galactic matter

OWNER
- U.S., NASA

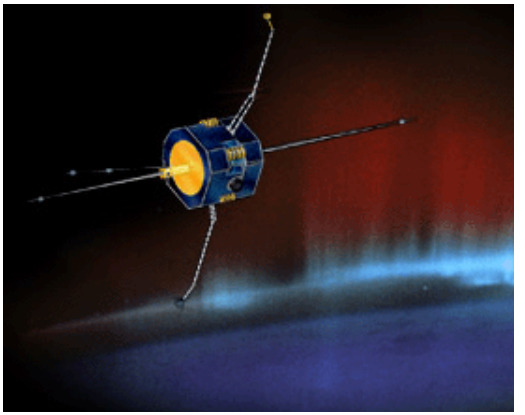
FAST

Fast Auroral Snapshot

The FAST satellite is designed to carry out in situ measurements of acceleration physics and related plasma processes associated with the Earth's aurora.

SENSORS:
ESA - Electrostatic Analyzers
TEAMS - Time-of-flight Energy Mass Angle Spectrograph
MFI - Magnetic Field Instrument
EF/LPI - Electric Field/Langmuir Probe Instrument
EFI - Electric Field Instrument

LINKS:
http://sunland.gsfc.nasa.gov/smex/fast/mission/
http://sprg.ssl.berkeley.edu/fast/



VITAL FACTS

- Orbit Type: elliptical near-polar
- Altitude: 350 km x 4175 km
- Inclination: 83°
- Launch Date: August 21, 1996
- Design Life: 1 year (exceeded)
- Measurements: Magnetic fields

OWNER
- U.S., NASA

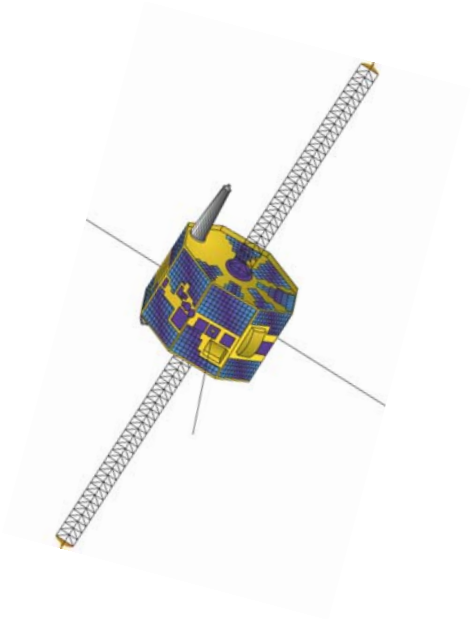
IMAGE

Imager for Magnetopause to Aurora Global Exploration

The IMAGE observatory is a spin-stabilized spacecraft that addresses broad science questions to understand the geospace environment and its response to the solar wind.

SENSORS:
LENA - Low-Energy Neutral-Atom Imager
MENA - Medium-Energy Neutral-Atom Imager
HENA - High-Energy Neutral-Atom Imager
EUV - Extreme Ultraviolet Imager
WIC - Wideband Imaging Camera
SI - Spectrographic Imager
GEO - Geocorona Photometer
RPI - Radio Plasma Imaging

LINKS:
http://image.gsfc.nasa.gov/
http://pluto.space.swri.edu/IMAGE/index.html



VITAL FACTS

- Orbit Type: Elliptical polar orbit
- Altitude: 1000 km x 45,922 km
- Inclination:
- Launch Date: March 25, 2000
- Design Life: 2-5 years
- Measurements: Radio sounding

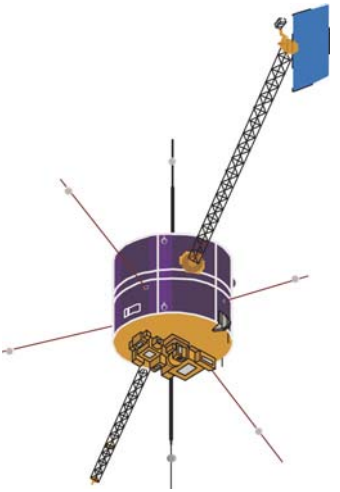
OWNER
- U.S., NASA

Polar

The Polar science team measures and studies how the solar wind plasma energy enters into the magnetosphere through the polar cusp on the day side of the magnetosphere by obtaining data from both high- and low-altitude perspectives of the Earth's polar regions.

SENSORS:
PWI - Plasma Waves Investigation
MFE - Magnetic Field Experiment
TIMAS - Toroidal Imaging Mass-Angle Spectrograph
EFI - Electric Field Instrument
TIDE/PSI - Thermal Ion Dynamics Experiment/Plasma Source Instrument
UVI - Ultraviolet Imager
VIS - Visible Imaging System
PIXIE - Polar Ionospheric X-Ray Imaging Experiment
CAMMICE - Charge and Mass Magnetospheric Ion Composition Experiment
CEPPAD - Comprehensive Energetic-Particle Pitch-Angle Distribution
SEPS - Source/Loss Cone Energetic Particle Spectrometer
HYDRA - Hot Plasma Analyzer

LINKS:
http://www-istp.gsfc.nasa.gov/istp/polar/



VITAL FACTS

- Orbit Type: elliptical geocentric orbit
- Altitude: 11500 x 56500 km
- Inclination: 90°
- Launch Date: February 24, 1996
- Design Life: 3 years (exceeded)
- Measurements: Electric fields

OWNER
- U.S., NASA

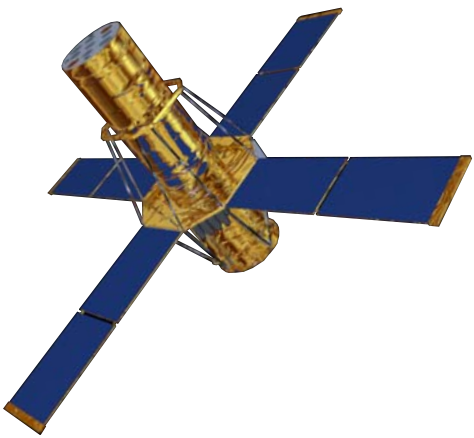
RHESSI

Reuven Ramaty High Energy Solar Spectroscopic Imager

RHESSI, Reuven Ramaty High Energy Solar Spectroscopic Imager, uses a sun-pointed, spin-stabilized spacecraft to investigate the physics of particle acceleration and energy release in solar flares.

SENSORS:
RHESSI - Reuven Ramaty High Energy Solar Spectroscopic Imager

LINKS:
http://hesperia.gsfc.nasa.gov/hessi/
http://hessi.ssl.berkeley.edu
http://www.specastro.com/ProgramsProducts/Hessi.asp



VITAL FACTS

- Orbit Type: Circular
- Altitude: 600 km
- Inclination:
- Launch Date: February 5, 2002
- Design Life: 2 Years (exceeded)
- Measurements: Imaging of solar flares

OWNER
- U.S., NASA

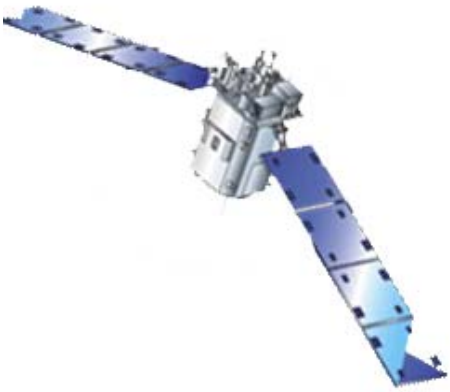
TIMED

Thermosphere, Ionosphere, Mesosphere, Energetics and Dynamics

The TIMED (Thermosphere, Ionosphere, Mesosphere, Energetics and Dynamics) mission will study the influences of the sun and humans on the Mesosphere and Lower Thermosphere/Ionosphere.

SENSORS:
GUVI - Global Ultraviolet Imager
SABER - Sounding of the Atmosphere using Broadband Emission Radiometry
SEE - Solar Extreme Ultraviolet Experiment
TIDI - TIMED Doppler Interferometer

LINKS:
http://stp.gsfc.nasa.gov/missions/timed/links.htm
http://www.timed.jhuapl.edu/mission2/index.html



VITAL FACTS

Orbit Type: Circular
- Altitude: 625 km
- Inclination:
- Launch Date: December 7, 2001
- Design Life: 2 Years (exceeded)
- Measurements: Solar ultraviolet radiation

OWNER
- U.S., NASA

TRACE

Transition Region and Coronal Explorer

The Transition Region and Coronal Explorer is a NASA Small Explorer (SMEX) mission to image the solar corona and transition region at high angular and temporal resolution.

SENSORS:
TRACE - Transition Region and Coronal Explorer

LINKS:
http://sunland.gsfc.nasa.gov/smex/trace/index.html

VITAL FACTS

- Orbit Type: Sun-synchronous
- Altitude: 600 x 650 km
- Inclination:
- Launch Date: April 2, 1998
- Design Life: 1 year (exceeded)
- Measurements: Temporal evolution of the magnetic field

OWNER
- U.S., NASA

VOYAGER I & II

Traveling through space over 27 years, the Voyager 1 spacecraft has reached 90 astronomical units (AU) from the Sun. It is the only spacecraft to have made measurements in the solar wind from such a great distance from the source of the dynamic solar environment. NASA placed a message aboard Voyager 1 and 2, intended to communicate a story of our world to extraterrestrials.

SENSORS:
LECP - Low energy charged particle investigation
MAG - Magnetic Field Investigation
UVS - Ultraviolet Spectrometer
CRS - Cosmic Ray Investigation
PWS - Plasma Wave Investigation
PRA - Planetary Radio Astronomy Subsystem

LINKS:
http://voyager.jpl.nasa.gov/

VITAL FACTS

- Orbit Type:
- Altitude: 90 AU
- Inclination:
- Launch Date: September 5, 1977
- Design Life: 43 years
- Measurements: Interstellar cosmic rays

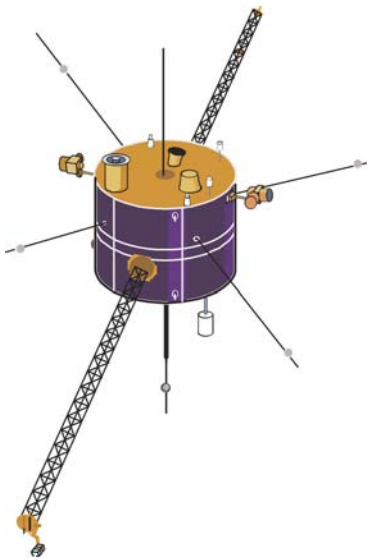
OWNER
- U.S., NASA

Wind

Wind is the first of two NASA spacecraft in the Global Geospace Science initiative and part of the ISTP Project.

SENSORS:
SWICS - Solar Wind Ion Composition Spectrometer
WAVES - Radio and Plasma Wave Experiment
EPACT - Energetic Particle Acceleration, Composition, and Transport
SWE - Solar Wind Experiment
MASS - High Mass Resolution Spectrometer
STICS - Suprathermal Ion Composition Spectrometer
MFI - Magnetic Field Investigation
3D PLASMA - 3-D Plasma and Energetic Particle Analyzer
TGRS - Transient Gamma-Ray Spectrometer
KONUS - Gamma Ray Burst Studies

LINKS:
http://pwg.gsfc.nasa.gov/istp/wind/



VITAL FACTS

- Orbit Type: Variable (double lunar swing-by and Lagrangian point - halo)
- Altitude: Variable
- Inclination:
- Launch Date: November 1, 1994
- Design Life: 3 years (exceeded)
- Measurements: Plasma processes in the near-Earth solar wind

OWNER
- Ecliptic plane observations

NASA-Led Earth Missions In Development

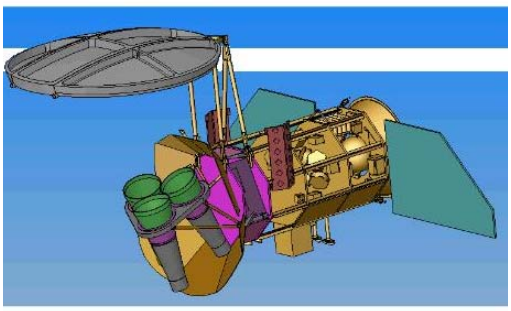
Aquarius

Aquarius is a focused satellite mission to measure global Sea Surface Salinity (SSS). Scientific progress is limited because conventional in situ SSS sampling is too sparse to give the global view of salinity variability that only a satellite can provide. Aquarius will resolve missing physical processes that link the water cycle, the climate, and the ocean.

SENSORS:
Aquarius Radiometer - Aquarius Radiometer/Scatterometer

LINKS:
http://essp.gsfc.nasa.gov/aquarius/

Applications



VITAL FACTS

- Orbit Type: Sun-synchronous
- Altitude: 600 km
- Inclination:
- Launch Date: September 2008
- Design Life: 3 years
- Measurements: Global and synoptic sea surface salinity

OWNER
- Argentina, CONAE
- U.S., NASA

Mission In Development

CALIPSO

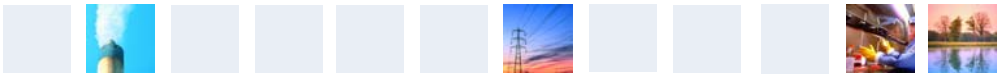
Cloud-Aerosol LIDAR and Infrared Pathfinder Satellite Observations

CALIPSO will provide key measurements of aerosol and cloud properties needed to improve climate predictions. CALIPSO will fly a 3-channel LIDAR with a suite of passive instruments to obtain coincident observations of radiative fluxes and atmospheric conditions. CALIPSO will fly in orbital formation along with Aqua, CloudSAT, PARASOL, and Aura to provide a comprehensive characterization of the structure and composition of clouds and their effects on climate under all weather conditions.

SENSORS:
IIR - Imaging Infrared Radiometer
WFC - Wide Field Camera
CALIOP - Cloud-Aerosol Lidar with Orthogonal Polarization

LINKS:
http://www-calipso.larc.nasa.gov/

Applications



VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 705 km
- Inclination: 98.2°
- Launch Date: July 22, 2005
- Design Life: 3 years
- Measurements: Aerosol and cloud properties

OWNER
- France, CNES
- U.S., NASA

Mission In Development

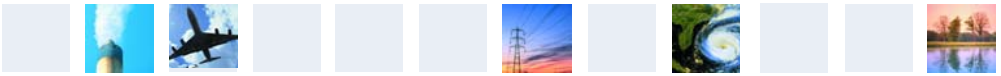
CloudSAT

CloudSat, a cooperative mission with Canada, will use advanced radar to "slice" through clouds to see their vertical structure, providing a completely new observational cpability from space. CloudSat will look at the structure, composition, and effects of clouds and will be one of the first satellites to study clouds on a global basis.

SENSORS:
CloudSat CPR - Cloud Profiling Radar

LINKS:
http://cloudsat.atmos.colostate.edu

Applications



VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 705 km
- Inclination: 98.2°
- Launch Date: July 22, 2005
- Design Life: 2 years
- Measurements: Cloud vertical structure and properties

OWNER
- U.S., NASA

Mission In Development

DSCOVR

Deep Space Climate Observatory

DSCOVR (formerly Triana)is a cooperative project between the NASA offices of Earth and Space science. It was designed to measure how solar radiation affects climate by using the Sun-Earth Lagrangian points (1.5 million km away from Earth) to make full Earth observations continuously.

SENSORS:
EPIC - Earth Polychromatic Imaging Camera
NISTAR - National Institute of Standards and Technology Advanced Radiometer
Plasma-Mag - Plasma-Magnetometer

LINKS:
http://triana.gsfc.nasa.gov/home/
http://www-pm.larc.nasa.gov/triana.html

Applications




VITAL FACTS

- Orbit Type: L1, Lagrange neutral gravity point between the Earth and the Sun
- Altitude: 1,507,000 km
- Inclination:
- Launch Date: January 1, 2008
- Design Life: 4 years
- Measurements: Early warning of solar events

OWNER
- U.S., NASA

Mission In Development

Glory

Glory will monitor the concentration and nature of both natural and anthropogenic aerosols with accuracy and coverage sufficient for quantification of the aerosol effect on climate, the anthropogenic component of this effect, and the long-term change of this effect caused by natural and anthropogenic factors. Glory will also monitor the total solar irradiance.

SENSORS:
TIM - Total Irradiance Monitor
APS - Aerosol Polarimetric Sensor

VITAL FACTS

- Orbit Type: Sun-synchronous
- Altitude: 824 km
- Inclination: 98.2°
- Launch Date: December 2007
- Design Life: 3 years
- Measurements: Global distribution of natural and anthropogenic aerosols

OWNER
- U.S., NASA

Mission In Development

GPM

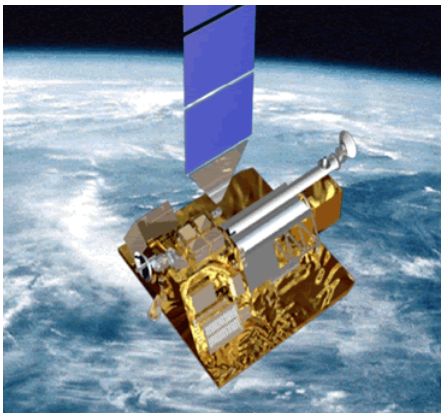
Global Precipitation Measurement

GPM is a joint mission with the Japan Aerospace Exploration Agency (JAXA) of Japan and other international partners. Building upon the success of the Tropical Rainfall Measuring Mission (TRMM), GPM will initiate global precipitation measurement. Its science objectives are to improve ongoing efforts to predict climate by providing near-global measurement of precipitation, its distribution, and physical processes, and to improve the accuracy of weather and precipitation forecasts through more accurate measurement of rain rates and latent heating.

SENSORS:
DPR - Dual-frequency Precipitation Radar
GMI - GPM Microwave Imager

LINKS:
http://gpm.gsfc.nasa.gov

Applications



VITAL FACTS

- Orbit Type: Non Sun-Synchronous
- Altitude: 600 km
- Inclination: 98.6°
- Launch Date: 2010
- Design Life: 3 years
- Measurements: Global precipitation

OWNER

- Japan, JAXA (formerly NASDA)
- U.S., NASA

Mission In Development

HYDROS

Hydrosphere State

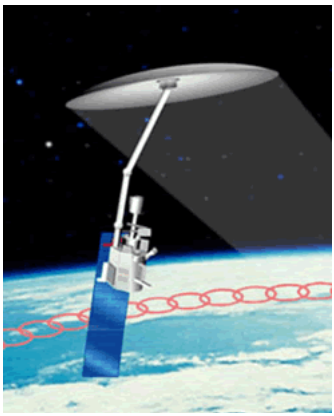
HYDROS will provide the first global views of Earth's changing soil moisture and land surface freeze/thaw conditions, leading to breakthroughs in weather and climate prediction and in the understanding of processes linking water, energy, and carbon cycles.

SENSORS:
HYDROS - Hydros Radar/Radiometer

LINKS:
http://hydros.gsfc.nasa.gov/
http://essp.gsfc.nasa.gov/hydros/

Applications





VITAL FACTS

- Orbit Type: Sun-synchronous
- Altitude: 670 km
- Inclination:
- Launch Date: September 2010
- Design Life: 4 years
- Measurements: Soil Moisture, hydroclimatology, hydrometeorology, freeze/thaw conditions

OWNER
- U.S., NASA

Mission In Development

NPP

NPOESS Preparatory Project

The NPP is a cooperative project with DoD and NOAA to extend key measurements in support of long-term monitoring of climate trends and of global biological productivity. It extends the measurement series being initiated with EOS Terra and EOS Aqua by providing a bridge between NASA's EOS missions and the National Polar-orbiting Operational Environmental Satellite System (NPOESS).

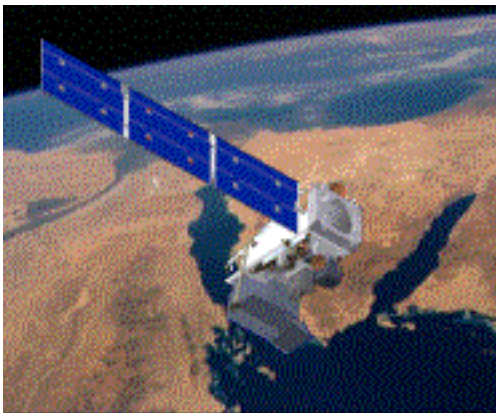
SENSORS:
CrIS - Crosstrack Infrared Sounder
OMPS - Ozone Mapping and Profiler Suite
ATMS - Advanced Technology Microwave Sounder
VIIRS - Visible/Infrared Imager/Radiometer Suite

LINKS: (opens a new browser window)
http://jointmission.gsfc.nasa.gov/

Applications







VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 824 km
- Inclination:
- Launch Date: October 31, 2006
- Design Life: 5 years
- Measurements: Atmospheric temperature and water vapor profiles

OWNER
- U.S., NASA
- U.S., NOAA

Mission In Development

OCO

Orbiting Carbon Observatory

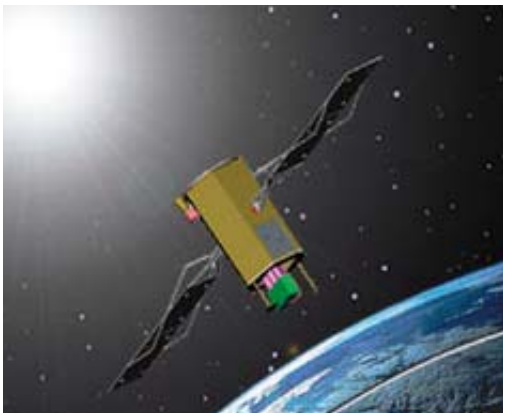
The OCO will provide space-based observations of atmospheric carbon dioxide (CO2), the principal anthropogenic driver of climate change. This mission uses mature technologies to address NASA's carbon cycle measurement requirement. OCO generates the knowledge needed to improve projections of future atmospheric CO2.

SENSORS:
OCO Spectrometers - Orbiting Carbon Observatory Spectrometers

LINKS:
http://essp.gsfc.nasa.gov/oco/index.html

Applications





VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 705 km
- Inclination:
- Launch Date: December 2007
- Design Life: 2 years
- Measurements: Maps of column-integrated CO2 dry air mole fraction

OWNER
- U.S., NASA

Mission In Development

NASA-Led Solar Missions In Development

AIM

Aeronomy of Ice in the Mesosphere

The AIM satellite mission will explore Polar Mesospheric Clouds (PMCs), also called noctilucent clouds, to find out why they form and why they are changing. Results from this mission will provide the basis for study of long-term variability in the mesospheric climate.

LINKS:
http://aim.hamptonu.edu/

VITAL FACTS

- Orbit Type: Polar
- Altitude: 300 mi
- Inclination:
- Launch Date: September 29, 2006
- Design Life: 6 years
- Measurements: PMC abundances, spatial distribution, particle size distributions, gravity wave activity, cosmic dust influx to the atmosphere, and vertical profile measurements of temperature, H_2O, OH, CH_4, O_3, CO_2, NO, and aerosols

OWNER
- U.S., Hampton University
- U.S., LASP
- U.S., NASA

Mission In Development

MMS

Magnetosphere Multiscale

MMS employs 5 identical spacecraft in a variably spaced tetrahedron. These spacecraft will study how small-scale processes control large-scale phenomenology, such as magnetotail dynamics, plasma entry into the magnetosphere, and substorm initiation.

LINKS:
http://stp.gsfc.nasa.gov/missions/mms/mms.htm

VITAL FACTS

- Orbit Type:
- Altitude:
- Inclination:
- Launch Date: January 2010
- Design Life: 2 years
- Measurements: Magnetic and electric fields

OWNER
- U.S., NASA

Mission In Development

SDO

Solar Dynamics Observatory

SDO is being designed to help us understand the Sun's influence on Earth and Near-Earth space by studying the solar atmosphere on small scales of space and time and in many wavelengths simultaneously.

SENSORS:
HMI - Helioseismic and Magnetic Imager
AIA - Atmospheric Imaging Assembly
EVE - Extreme Ultraviolet Variability Experiment

LINKS:
http://sdo.gsfc.nasa.gov/

VITAL FACTS

- Orbit Type: Inclined Geosynchronous
- Altitude: 35,000 km
- Inclination: 28.5°
- Launch Date: April 1, 2008
- Design Life: 5 years
- Measurements: Radiation levels of solar output

OWNER
- U.S., NASA

Mission In Development

STEREO

Solar Terrestrial Relations Observatory

The STEREO mission will use two identically equipped spacecraft to provide revolutionary 3-D imaging of coronal mass ejections. The STEREO mission is a multilateral international collaboration involving participants from France, Germany, the United States, and United Kingdom.

LINKS:
http://stp.gsfc.nasa.gov/missions/stereo/stereo.htm
http://stereo.jhuapl.edu/mission/overview/overview.html

VITAL FACTS

- Orbit Type: Heliocentric Elliptical
- Altitude: ~1 AU
- Inclination:
- Launch Date: February 11, 2006
- Design Life: 2 years
- Measurements: 3-D images of the structure of coronal mass ejections

OWNER:
- France, CNRS
- U.S., JHU/APL
- U.S., NASA
- U.S., NRL

Mission In Development

ST5

Science Technology 5

Space Technology 5 (ST5) is the fourth deep space mission in NASA's New Millennium Program. During flight validation of its technologies, ST5 will measure the effect of solar activity on the Earth's magnetosphere, the region of upper atmosphere that surrounds our planet. ST5's objective is to demonstrate and flight qualify several innovative technologies and concepts for application to future space missions.

LINKS:
http://nmp.jpl.nasa.gov/st5/index.html

VITAL FACTS

- Orbit Type: Elliptical Geocentric
- Altitude: 3,000 km
- Inclination:
- Launch Date: February 28, 2006
- Design Life: TBD
- Measurements: The effect of solar activity on the Earth's magnetos phere

OWNER
- U.S., NASA

Mission In Development

THEMIS

Time History of Events and Macroscale Interactions During Substorms

THEMIS consists of five identical probes. These probes will answer fundamental outstanding questions regarding the magnetospheric substorm instability, a dominant mechanism of transport and explosive release of solar wind energy within Geospace. THEMIS will also address questions in radiation belt physics and solar wind/magnetosphere energy coupling.

LINKS:
http://sprg.ssl.berkeley.edu/themis/about/about.htm

VITAL FACTS

- Orbit Type: Elliptical, High-Earth
- Altitude: 10, 20, and 30 RE
- Inclination:
- Launch Date: August 22, 2006
- Design Life: 2 years
- Measurements: Particles and fields on orbits which optimize tail-aligned conjunctions over North America.

OWNER
- U.S., NASA
- U.S., Swales Aerospace

Mission In Development

Interagency Partnerships

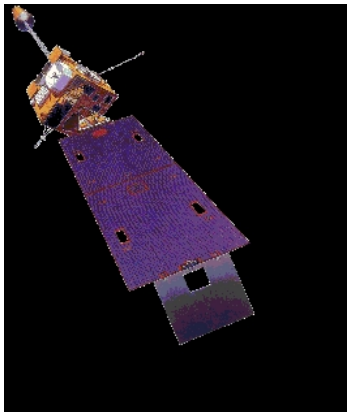
GOES 8-12

Geostationary Operational Environmental Satellites

The GOES series is a reimbursable project for NOAA. GOES-M (also known as GOES-12) provides weather imagery and quantitative sounding data used to support weather forecasting, severe storm tracking, and meteorological research.

SENSORS:
GOES Imager - Geostationary Operational Environmental Satellite Imager
SEM-2 - Space Environment Monitor, Generation 2
GOES Sounder - Geostationary Operational Environmental Satellite - Sounder
SXI - Solar X-ray Imager
SARSAT - Search And Rescue Satellite Aided Tracking

LINKS:
http://www.oso.noaa.gov/goes/
http://rsd.gsfc.nasa.gov/goes/text/goesmstatus.html
http://goespoes.gsfc.nasa.gov/aboutgoes/current.htm



VITAL FACTS

- Orbit Type: Geostationary
- Altitude: 36000 km
- Inclination: Longitude: 75° W or 135° W°
- Launch Date: July 23, 2001
- Design Life: 5 years
- Measurements: Solar X-ray flux

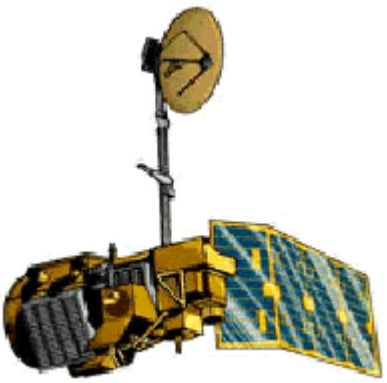
OWNER
- U.S., NOAA

Landsat 5

The fifth in a series of Earth observation platforms, Landsat 5 continued the Thematic Mapper archive started in 1982. Current transmissions are by direct downlink only, as there is no recording capability.

SENSORS:
TM - Thematic Mapper
MSS - Multispectral Scanner

LINKS:
http://geo.arc.nasa.gov/sge/landsat/landsat.html
http://www.earth.nasa.gov/history/landsat/landsat5.html



VITAL FACTS

- Orbit Type: Sun-synchronous
- Altitude: 705 km
- Inclination: 98.2°
- Launch Date: March 1, 1984
- Design Life: 5 years (exceeded)
- Measurements: Ground cover and land use imagery

OWNER
- U.S., NASA
- U.S., NOAA
- U.S., USGS

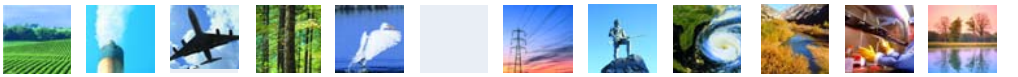
Landsat 7

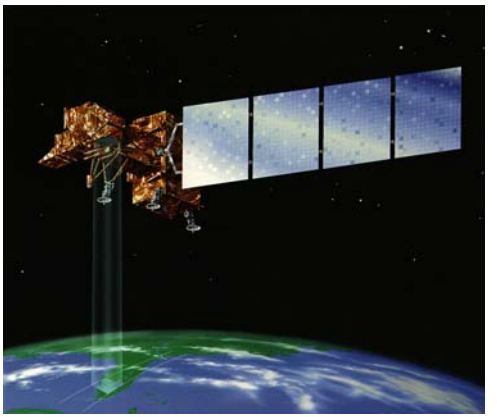
NASA's Landsat provides well-calibrated, multispectral, moderate resolution, substantially cloud-free, sunlit digital images of the Earth's continental and coastal areas with global coverage on a seasonal basis using the Enhanced Thematic Mapper Plus instrument. Operations were transferred to the U.S. Geological Survey in 2000.

SENSORS:
ETM+ - Enhanced Thematic Mapper Plus

LINKS:
http://landsat7.usgs.gov/
http://landsat.gsfc.nasa.gov/

Applications





VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 705 km
- Inclination: 98.2°
- Launch Date: April 15, 1999
- Design Life: 5 years
- Measurements: Land cover and land use change

OWNER
- U.S., NASA
- U.S., USGS

POES 15-17

Polar-orbiting Operational Environmental Satellite, NOAA K-M

NOAA-M POES (National Oceanic and Atmospheric Administration Polar-orbiting Operational Environmental Satellites) provides global coverage of numerous atmospheric and surface parameters for weather forecasting and meteorological research, as well as space environment monitors and an aircraft and maritime emergency beacon system. This is a reimbursable project for NOAA. NASA builds and launches the satellites.

SENSORS:
AMSU-A - Advanced Microwave Sounding Unit-A
SBUV-2 - Solar Backscatter Ultraviolet Radiometer 2
AVHRR - Advanced Very High Resolution Radiometer 3
HIRS - High Resolution Infrared Radiation Sounder
SEM-2 - Space Environment Monitor, Generation 2
SARSAT - Search And Rescue Satellite Aided Tracking
A-DCS - ARGOS Data Collection System
AMSU-B - Advanced Microwave Sounding Unit-B

LINKS:
http://goespoes.gsfc.nasa.gov/

VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 833 km
- Inclination: 98.8°
- Launch Date: June 24, 2002
- Design Life: 2 years
- Measurements: Global atmospheric temperature and humidity profiles

OWNER
- U.S., NOAA

Interagency Partnerships In Development

GOES N-P

Geostationary Operational Environmental Satellites N - P

The GOES series N-P will be a vital contributor to weather, solar, and space operations and science. The GOES N-P series will aid activities ranging from severe storm warnings to resource management and advances in science. GOES N-P data will add to the global community of knowledge, embracing many civil and government environmental forecasting organizations.

SENSORS:
AMSU-A - Advanced Microwave Sounding Unit-A
SBUV-2 - Solar Backscatter Ultraviolet Radiometer 2
AVHRR - Advanced Very High Resolution Radiometer 3
HIRS - High Resolution Infrared Radiation Sounder
SEM-2 - Space Environment Monitor, Generation 2
MHS - Microwave Humidity Sounder
SARSAT - Search And Rescue Satellite Aided Tracking

LINKS:
http://projects.osd.noaa.gov/IJPS/characteristic.htm

VITAL FACTS

- Orbit Type: Geostationary
- Altitude:
- Inclination: Longitude: 135° W and 75° W°
- Launch Date: May 4, 2005 (N)
- Design Life: 2 years
- Measurements: Spectral solar irradiance

OWNER
- U.S., NOAA

Mission In Development

GOES R

Geostationary Operational Environmental Satellite R

The multi-mission GOES series is a vital contributor to weather, solar, and space operations and science. The GOES R series is still in planning.

SENSORS:

LINKS:
http://goes2.gsfc.nasa.gov/spacecraft/goes_r_spacecraft.htm

Applications




VITAL FACTS

- Orbit Type: Geostationary
- Altitude:
- Inclination: Longitude: 135° W and 75° W°
- Launch Date: 2012
- Design Life: 5 years
- Measurements: Solar activity, the charged particle environment, and the Earth's magnetic field

OWNER
- U.S., NOAA

Mission In Development

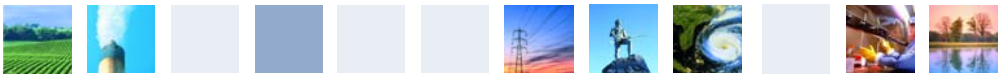
NPOES-1

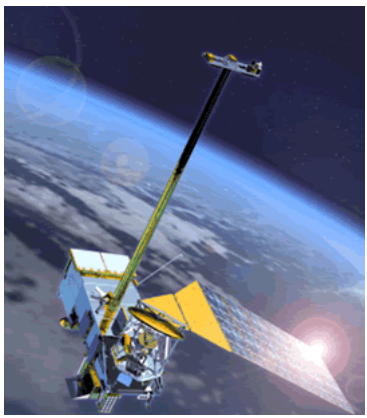
National Polar-orbiting Operational Environmental Satellite System

NPOESS will provide the U.S. with an enduring capability to measure atmospheric, land, and oceanic environmental parameters globally. The system will provide timely and accurate weather and environmental data to weather forecasters, military commanders, civilian leaders, and the scientific community. The current plan is for the NPOESS constellation to consist of three polar-orbiting satellites.

SENSORS:
TIM - Total Irradiance Monitor
CMIS - Conical Microwave Imager/Sounder
CrIS - Crosstrack Infrared Sounder
GPSOS - Global Positioning System Occultation Sensor
OMPS - Ozone Mapping and Profiler Suite
OLI - Operational Land Imager
SESS - Space Environment Sensor Suite
ATMS - Advanced Technology Microwave Sounder
VIIRS - Visible/Infrared Imager/Radiometer Suite
APS - Aerosol Polarimetric Sensor
SSALT-2 - Solid State Radar ALTimeter
SARSAT - Search And Rescue Satellite Aided Tracking
A-DCS - ARGOS Data Collection System
ERBS - Earth Radiation Budget Sensor
TSIS - Total Solar
Irradiance Sensor

Applications





VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 833 km
- Inclination: 98.8°
- Launch Date: June 24, 2002
- Design Life: 2 years
- Measurements: Atmospheric tem perature, water vapor profiles, and auroral boundary traits

OWNER
- U.S., NOAA

LINKS:
http://www.ipo.noaa.gov/index2.html

Mission In Development

POESN-N′

Polar-orbiting Operational Environmental Satellites N - N'

The NOAA POES satellites N and N' provide global coverage of numerous atmospheric and surface parameters for weather forecasting and meteorological research, as well as space environment monitors and an aircraft and maritime emergency beacon system. This is a reimbursable project for NOAA. NASA builds and launches the satellites.

SENSORS:
AMSU-A - Advanced Microwave Sounding Unit-A
SBUV-2 - Solar Backscatter Ultraviolet Radiometer 2
AVHRR - Advanced Very High Resolution Radiometer 3
HIRS - High Resolution Infrared Radiation Sounder
SEM-2 - Space Environment Monitor, Generation 2
MHS - Microwave Humidity Sounder
SARSAT - Search And Rescue Satellite Aided Tracking

LINKS:
http://projects.osd.noaa.gov/IJPS/characteristic.htm

VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 870 km
- Inclination: 98.8°
- Launch Date: March 2005 (N)
- Design Life: 2 years
- Measurements: Spectral solar irradiance

OWNER
- U.S., NOAA

Mission In Development

Interagency Partnerships In Development-Solar

CINDI

Coupled Ion-Neutral Dynamics Investigation

CINDI seeks to discover how the neutral gas motions and the charged particle motions are related. The CINDI investigation is carried out as an enhancement to the science objectives of the Communication/Navigation Outage Forecast System (C/NOFS).

SENSORS:
IVM - Ion Velocity Meter
NWM - Neutral Wind Meter

LINKS:
http://129.110.7.63/heelis/cindi.html

VITAL FACTS

- Orbit Type: Low-Earth
- Altitude: 400-700 km
- Inclination: 13°
- Launch Date: January 2005
- Design Life: 3 years
- Measurements: Ion drift velocity vector from 400 to 700 km

OWNER
- U.S., NASA

Mission In Development

TWINS

Two Wide-angle Imaging Neutral-atom Spectrometers

The TWINS mission provides a new capability for stereoscopically imaging the magnetosphere. By imaging the charge exchange of neutral atoms over a broad energy range using two identical instruments on two widely spaced high-altitude, high-inclination spacecraft, TWINS will enable the 3-dimensional visualization and the resolution of large scale structures and dynamics within the magnetosphere.

SENSORS:
TEI - TWINS ENA (Energetic Neutral Atom) Imager
Lyman-alpha Detector

LINKS:
http://nis-www.lanl.gov/nis-projects/twins/

VITAL FACTS

- Orbit Type: Elliptical Earth (Molniya orbit)
- Altitude: 300-46000 km
- Inclination: 63.4°
- Launch Date: January 2005
- Design Life: TBD
- Measurements: Earth's magnetic field

OWNER
- U.S., LANL
- U.S., NASA

Mission In Development

International Partnerships

CHAMP

Challenging Mini-Satellite Payload

CHAMP is a cooperative project between the U.S. and Germany. It is designed to map the Earth's global long- to medium-wavelength gravity field and the Earth's global magnetic field and temporal variations. CHAMP is also designed to perform atmosphere/ionosphere sounding.

SENSORS:
GPS Receiver - Global Positioning System Receiver
LRA - Laser Retroreflector Array
OVM - Overhauser Magnetometer
FGM - Fluxgate Magnetometer
DIDM - Digital Ion Drift Meter
STAR - Space Three-axis Accelerometer for Research
ASC - Advanced Star Compass

LINKS:
http://op.gfz-potsdam.de/champ/

Applications

VITAL FACTS

- Orbit Type: Non Sun-Synchronous
- Altitude: 450 km
- Inclination: 87.27°
- Launch Date: July 15, 2000
- Design Life: 5 years
- Measurements: Temporal variance in the Earth's gravity and magnetic fields

OWNER
- Germany, GFZ

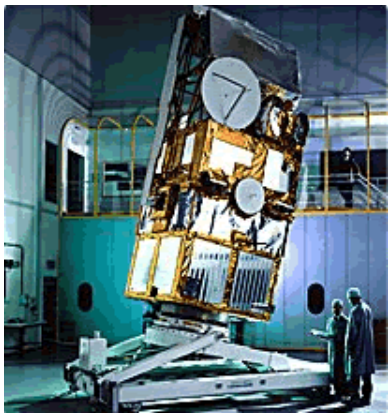
ERS I/II

European Remote Sensing I/II

The European Remote Sensing (ERS) satellites earth observation mission has been operating for over 10 years. The ERS satellites carry a suite of instruments to provide data for scientific and commercial applications. ERS-2 was launched in 1995 and is the current operational satellite. ERS-2 continues to provide excellent data, far exceeding its nominal lifetime.

SENSORS:
LRA - Laser Retroreflector Array
ATSR - Along Track Scanning Radiometer
GOME - Global Ozone Monitoring Experiment
RA-1 - Radar Altimeter-1
AMI/WS - Active Microwave Instrument/Wind Scatterometer
MWR - Microwave Radiometer

LINKS:
http://earth.esa.int/ers/



VITAL FACTS
- Orbit Type: Sun-Synchronous
- Altitude: 780 km
- Inclination: 98.52°
- Launch Date: July 17, 1991
- Design Life: 2 years
- Measurements: Provides all-weather images of ocean, ice, and land surfaces.

OWNER
- Europe, ESA

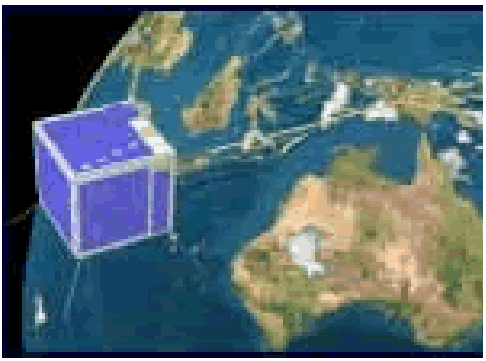
FedSat

Federation Satellite

FedSat is the first Australian-built satellite in over 30 years. It has been delivering scientific data to its ground station in Adelaide almost daily. This information is used by Australian and international researchers to study space weather, to help improve space computers, communication systems and other satellite technology, and to support research on navigation and satellite tracking.

SENSORS:
GPS Receiver - Global Positioning System Receiver
CPE - Communications Payload Experiment
HPCE - High Performance Computer Experiment
NewMag - New Magnetometer Experiment

LINKS:
http://www.crcss.csiro.au/fedsat/default.htm
http://www.auspace.com.au/projects/fedsat.htm



VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 802.9 km
- Inclination: 98.67°
- Launch Date: December 14, 2002
- Design Life: 3 years
- Measurements: Electrical currents and perturbations in the Earth's magnetic field, tests mobile communications

OWNER
- Australia, CSIRO

Jason-1

Jason-1 is a joint mission between France and the U.S. to monitor global ocean circulation, to improve global climate predictions, and to monitor events such as El Niño Southern Oscillation conditions and ocean eddies.

SENSORS:
GPS Receiver - Global Positioning System Receiver
LRA - Laser Retroreflector Array
JMR - Jason-1 Microwave Radiometer
SSALT-2 - Solid State Radar ALTimeter
DORIS - Doppler Orbitography and Radiopositioning Integrated by Satellite

LINKS:
http://sealevel.jpl.nasa.gov
http://topex-www.jpl.nasa.gov/mission/jason-1.html

Applications

VITAL FACTS

- Orbit Type: Non Sun-Synchronous Circular
- Altitude: 1,336 km
- Inclination: 66°
- Launch Date: December 7, 2001
- Design Life: 5 years
- Measurements: Brightness temperature

OWNER
- France, CNES
- U.S., NASA

SAC-C

Satelite de Applications Cientificas

SAC-C will provide multispectral imaging of terrestrial and coastal environments. The spacecraft will study the structure and dynamics of the Earth's atmosphere, ionosphere and geomagnetic field. SAC-C will seek to measure the space radiation in the environment and its influence on advanced electronic components.

SENSORS:
MMRS - Multispectral Medium Resolution Scanner
ICARE - Influence of Space Radiation on Advanced Components
INES - Italian Navigation Experiment
GOLPE - GPS Occultation and Passive Reflection Experiment
HRTC - High Resolution Technological Camera
WTE - Whale Tracker Experiment
IST - Italian Star Tracker
HSC - High Sensitivity Camera
SHM - Scalar Helium Magnetometer

LINKS:
http://www.gsfc.nasa.gov/gsfc/service/gallery/fact_sheets/spacesci/sac-c.htm

VITAL FACTS

- Orbit Type: Sun-synchronous
- Altitude: 702 kilometers
- Inclination: 98.2°
- Launch Date: November 21, 2000
- Design Life: 4 years
- Measurements: High energy radiation environment, trapped particle intensities and energy distribution

OWNER
- Argentina, CONAE
- Brazil, INDPE
- Denmark, DSRI
- France, CNES
- Italy, ASI
- U.S., NASA

SAGE III

Stratospheric Aerosol and Gas Experiment III

SAGE III is a joint mission between NASA and the Russian Space Agency that is one of nine experiments on the Russian Metero-3M spacecraft.

SENSORS:
SAGE III - Stratospheric Aerosol and Gas Experiment III

LINKS:
http://www-sage3.larc.nasa.gov/

Applications



VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 1020 ±20 km
- Inclination: 99.64°
- Launch Date: December 10, 2001
- Design Life: 5 years
- Measurements: Aerosol extinction

OWNER
- Russia, RSA
- U.S., NASA

International Partnerships In Development

OSTM

Ocean Surface Topography Mission

OSTM will provide research quality oceanographic sea surface height data into an operational mode for continued climate forecasting research and science. It will continue and extend measurements conducted by the TOPEX/Poseidon and Jason-1 missions.

SENSORS:
GPS Receiver - Global Positioning System Receiver
LRA - Laser Retroreflector Array
SSALT - Solid State Radar ALTimeter
JMR - Jason-1 Microwave Radiometer
DORIS - Doppler Orbitography and Radiopositioning Integrated by Satellite
WSOA - Wide Swath Ocean Altimeter

LINKS:
http://topex-www.jpl.nasa.gov/mission/ostm.html

Applications


VITAL FACTS

- Orbit Type: Non Sun-Synchronous
- Altitude: 1336 km
- Inclination: 66°
- Launch Date: April 2008
- Design Life: 5 years
- Measurements: Climate monitoring

OWNER
- France, CNES
- U.S., NASA

Mission In Development

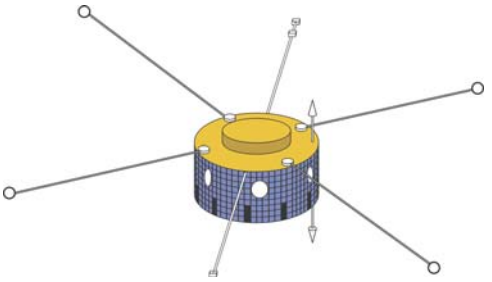
International Partnerships Solar

Cluster

Cluster II is part of an international collaboration to investigate the physical connection between the Sun and Earth. Flying in a tetrahedral formation, the four spacecraft collect data on small-scale changes in near-Earth space and the interaction between the charged particles of the solar wind and Earth's atmosphere.

SENSORS:
EDI - Electron Drift Instrument
ASPOC - Active Spacecraft Potential Control
STAFF - Spatio-Temporal Analysis of Field Fluctuation
EFW - Electric Field and Wave
DWP - Digital Wave Processing
WHISPER - Waves of High frequency and Sounder for Probing of Electron density by Relaxation
WBD - Wide Band Data
PEACE - Plasma Electron And Current Experiment
CIS - Cluster Ion Spectrometry
RAPID - Research with Adaptive Particle Imaging Detectors

LINKS:
http://clusterlaunch.esa.int/science-e/www/area/index.cfm?fareaid=8



VITAL FACTS

- Orbit Type: Elliptical polar orbit
- Altitude: 19,000 to 119,000 km
- Inclination:
- Launch Date: July 16, 2000 and August 9, 2000
- Design Life: 5 years
- Measurements: Electrical potential

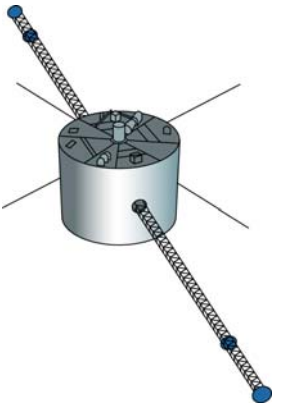
OWNER
- Europe, ESA

Geotail

The GEOTAIL mission is a collaborative project undertaken by the Institute of Space and Astronautical Science (ISAS) and the National Aeronautics and Space Administration (NASA). Its primary objective is to study the dynamics of the Earth's magnetotail. Geotail is a spin-stabilized spacecraft utilizing mechanically despun antennas.

SENSORS:
CPI - Comprehensive Plasma Instrument
EFD - Electric Field Detector
EPIC - Energetic Particles and Ion Composition
HEP - High Energy Particles
LEP - Low Energy Particles
MGF - Magnetic Fields Measurement
PWI - Plasma Wave Investigation

LINKS:
http://www.isas.ac.jp/e/enterp/missions/geotail/index.shtml
http://www-istp.gsfc.nasa.gov/istp/geotail/



VITAL FACTS

- Orbit Type: Variable (double lunar swingby and low inclination orbit)
- Altitude: Variable
- Inclination:
- Launch Date: July 24, 1992
- Design Life: ~4 years (exceeded)
- Measurements: Global energy flow and transformation in the magnetotail

OWNER
- Japan, ISAS
- U.S., NASA

SOHO

Solar and Heliospheric Observatory

SOHO, the Solar and Heliospheric Observatory, is a project of international cooperation between ESA and NASA to study the Sun, from its deep core to the outer corona, and the solar wind. SOHO is a three-axis stabilized spacecraft that constantly faces the Sun.

SENSORS:
CDS - Coronal Diagnostic Spectrometer
CELIAS - Charge, Element, and Isotope Analysis System
EIT - Extreme Ultraviolet Imaging Telescope
GOLF - Global Oscillations at Low Frequencies
LASCO - Large Angle and Spectrometric Coronagraph
MDI/SOI - Michelson Doppler Imager/Solar Oscillations Investigation
SUMER - Solar Ultraviolet Measurements of Emitted Radiation
SWAN - Solar Wind Anisotropies
UVCS - Ultraviolet Coronagraph Spectrometer
VIRGO - Variability of Solar Irradiance and Gravity Oscillations
COSTEP - Comprehensive Suprathermal and Energetic Particle Analyzer
ERNE - Energetic and Relativistic Nuclei and Electron Experiment

LINKS:
http://sohowww.nascom.nasa.gov/

VITAL FACTS

• Orbit Type: Earth-sun Libration Point (L1)
• Altitude: 1.5 million km
• Inclination:
• Launch Date: December 2,1995
• Design Life: 2 years (exceeded)
• Measurements: Solar wind

OWNER
• Europe, ESA
• U.S., NASA

Ulysses

Ulysses, with an array of sensors for gauging the invisible winds, atoms, dust grains, and magnetic fields that permeate space around the Sun, is contributing to a better understanding of the Sun and its heliosphere.

SENSORS:
SWICS - Solar Wind Ion Composition Spectrometer
COSPIN - Cosmic-ray and Solar Particle Investigation
GRB - Gamma-Ray Burst Experiment
DUST - Cosmic Dust Experiment
EPAC/GAS - Energetic Particle Composition /Interstellar Neutral Gas Experiment
FGM/VHM - Fluxgate Magnetometer/ Vector Helium Magnetometer
HI-SCALE - Heliosphere Instrument for Spectra Composition and Anisotropy at Low Energies
SWOOPS - Solar Wind Observations Over the Poles of the Sun
URAP - Unified Radio and Plasma-Wave Experiment
GWE - Gravitational Wave Experiment

LINKS:
http://www.esa.int/export/esaSC/120395_index_0_m.html

VITAL FACTS

- Orbit Type: Heliocentric
- Altitude: 5.4 x 1.3 AU
- Inclination:
- Launch Date: October 6, 1990
- Design Life: 5 years (exceeded)
- Measurements: Dust and gas

OWNER
- Europe, ESA
- U.S., NASA

International Partnerships In Development Solar

Solar B

Solar-B will determine the solar origins of space weather and global change, providing a comprehensive study of stellar magnetic fields and a new view into the magnetic dynamics of the plasma universe.

LINKS:
http://stp.gsfc.nasa.gov/missions/solar-b/solar-b.htm

VITAL FACTS

- Orbit Type: Sun-synchronous
- Altitude: 600 km
- Inclination: 97.7°
- Launch Date: September 2006
- Design Life: 3 years
- Measurements: Modulation of the Sun's Luminosity

OWNER
- Japan, JAXA
- U.K., PPARC
- U.S., NASA

Mission In Development

Commercial Partnerships

OrbView-1

ORBIMAGE's OrbView-1 was the world's first commercial imaging satellite. The satellite's miniaturized camera provided daily severe weather images and global lightning information during day and night operations. Its atmospheric monitoring instrument provided global meteorological data useful for improving long-term weather forecasts.

SENSORS:
OTD - Optical Transient Detector
GPS Receiver - Global Positioning System Receiver

LINKS:
http://www.orbimage.com/corp/orbimage_system/ov1/

VITAL FACTS

- Orbit Type: Sun-synchronous
- Altitude: 740 km
- Inclination: 70°
- Launch Date: April 3, 1995
- Design Life: 2 years (exceeded)
- Measurements: Broad-area cloud-to-cloud lightning imagery, severe weather patterns

OWNER
- U.S., ORBIMAGE

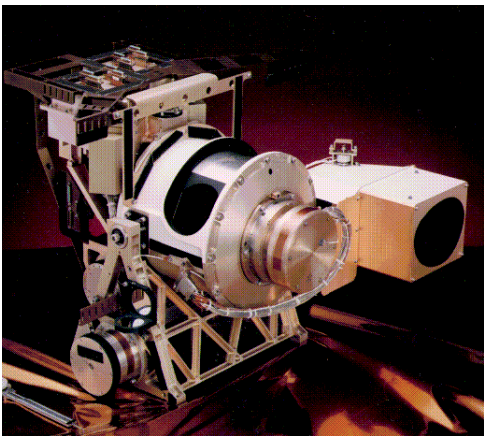
OrbView-2

OrbView- 2/Sea-viewing Wide Field-of-view Sensor

The Sea-viewing Wide Field-of-view Sensor (SeaWiFS) Project provides quantitative data on global ocean bio-optical properties to the Earth science community. Subtle changes in ocean color signify various types and quantities of marine phytoplankton (microscopic marine plants). The SeaWiFS Project will develop and operate a research data system that will process, calibrate, validate, archive, and distribute data received from an Earth-orbiting ocean color sensor.

SENSORS:
SeaWiFS - Sea-viewing Wide Field-of-View Sensor

LINKS: http://seawifs.gsfc.nasa.gov/SEAWIFS.html
http://www.orbimage.com/corp/orbimage_system/ov2/



VITAL FACTS

- Orbit Type: Sun-Synchronous
- Altitude: 705 km
- Inclination: 98.2°
- Launch Date: August 1, 1997
- Design Life:
- Measurements: Ocean color for monitoring plankton and sedimentation levels in the oceans and for assessing the health of land-based vegetation on a global basis.

OWNER
- U.S., NASA

Science Mission Directorate
Earth-Sun System Division

This booklet is part of a series of three booklets. Please read the Satellite Models booklet for more information on the individual Models and the Partner Decision Support Tools booklet for more information on support tools.

These booklets are derived from the **Earth-Sun Science System Components Knowledge Base which is available on-line at http://www.asd.ssc.nasa.gov/m2m**

For more information please e-mail us at: EarthScience@ssc.nasa.gov

http://science.hq.nasa.gov

NASA: Explore. Discover. Understand